

# Assessing Naval Aviation Maintenance Safety: *Error Reporting, Data Management, and Trend Analysis*



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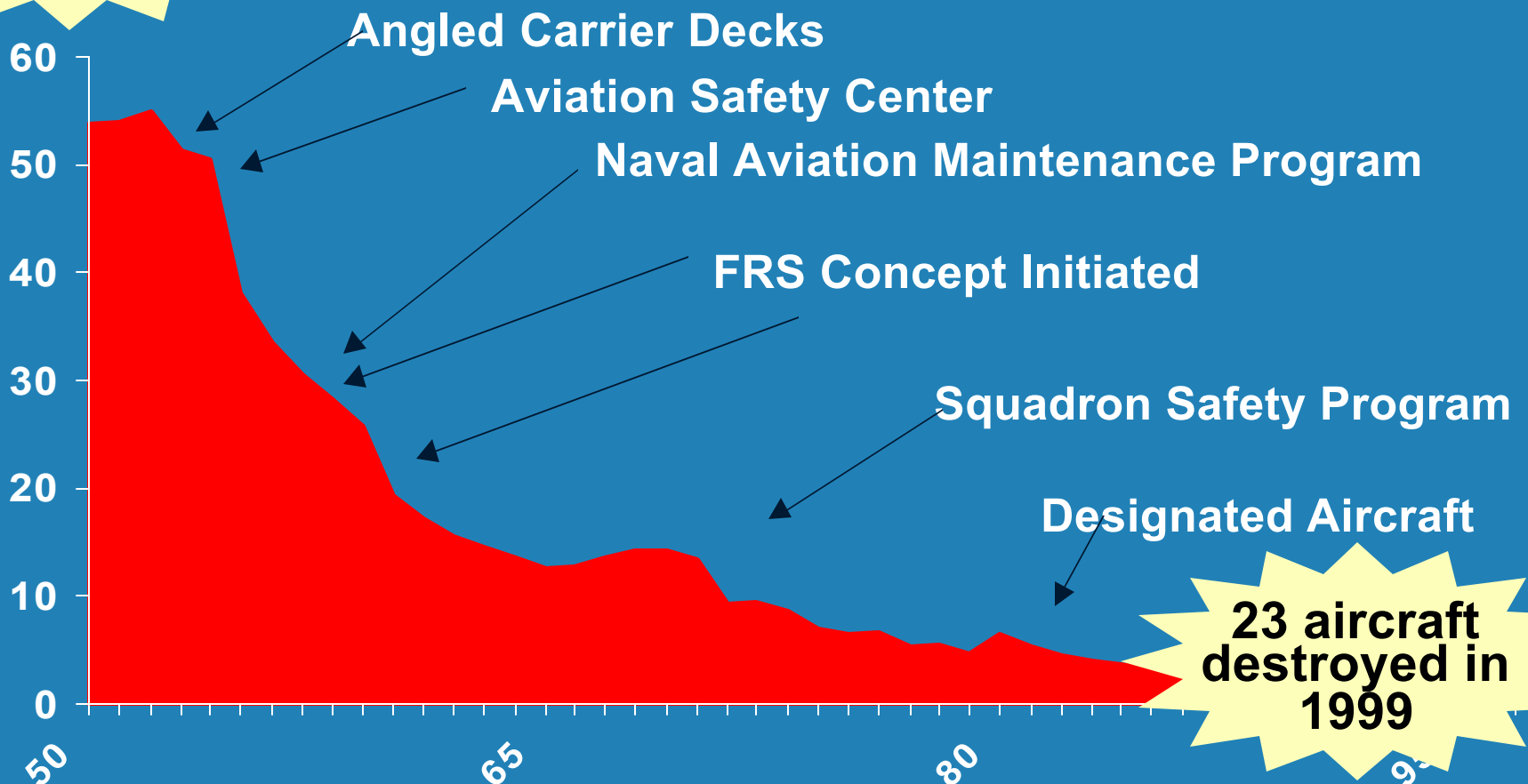


# Naval Aviation Flight Mishap Rate

**776 aircraft  
destroyed in  
1954**

**FY50-99**

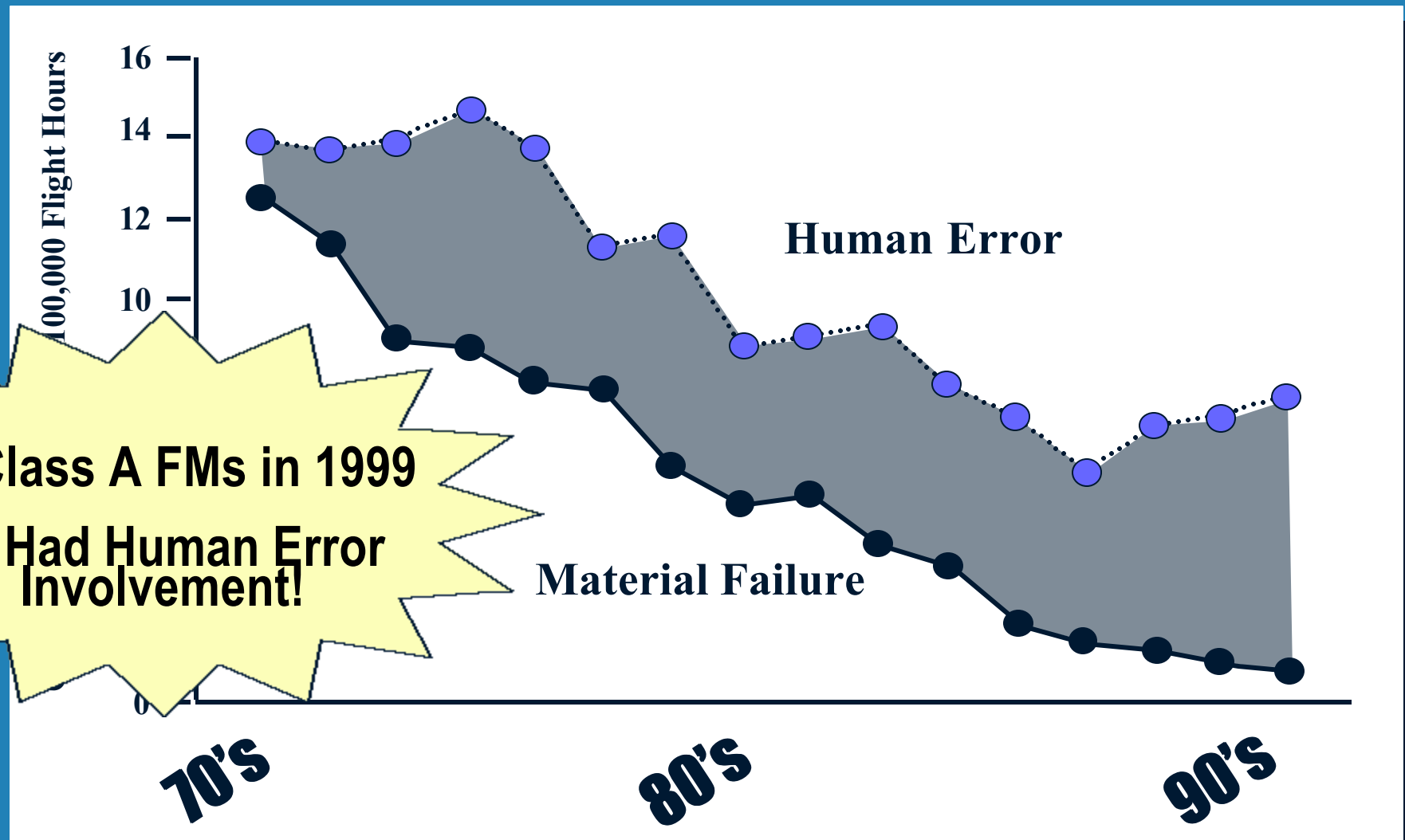
Class A Flight Mishaps /100,000 Flight Hours



**23 aircraft  
destroyed in  
1999**



# Engineering & Administrative Controls have Impacted Hardware Reliability, but....





# Human Factors Intervention Strategy Matrix

	Engineering Control	Administrative Control	Personnel Control
Error Prevention			<b>Most Mishap Recommendations Fall into Just Two Categories!!!!!!</b>
Performance Enhancement			

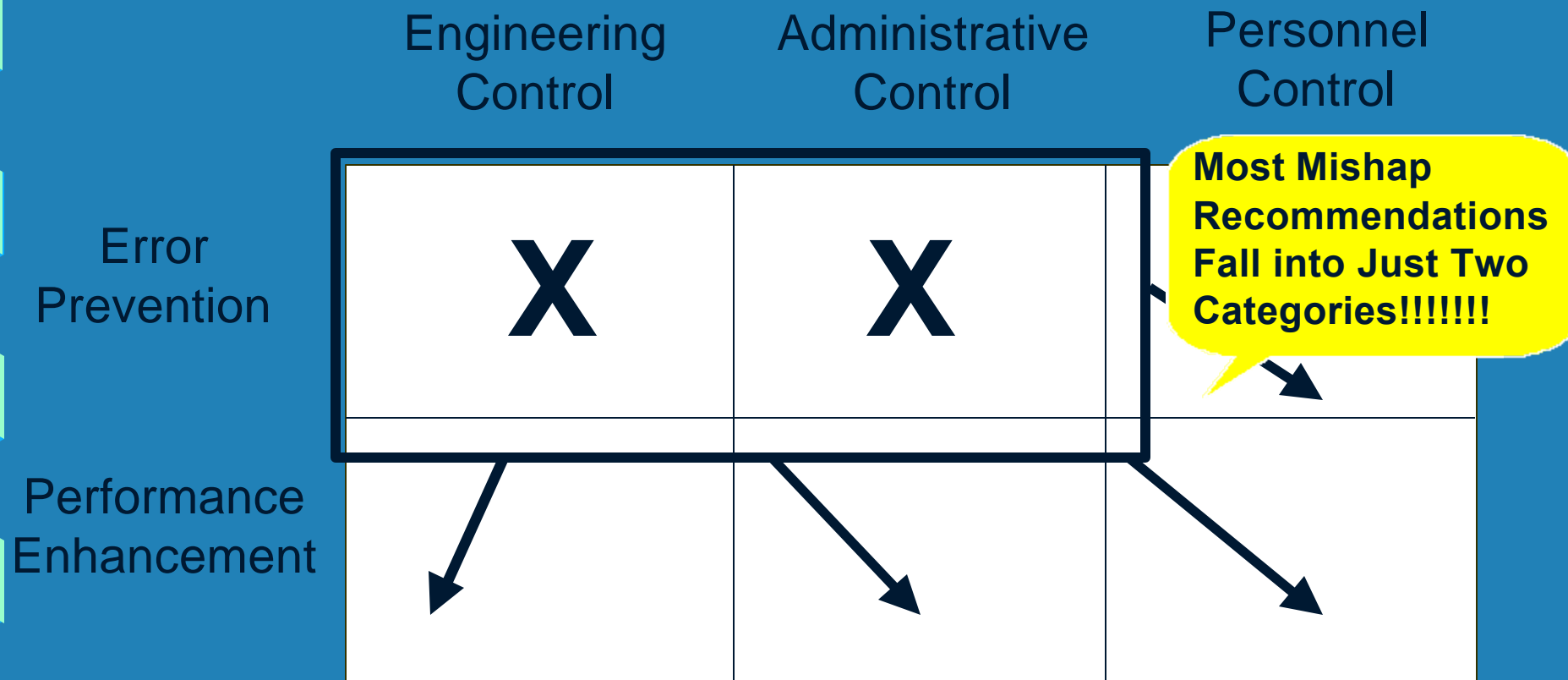


# Human Factors Intervention Strategy Matrix

	Engineering Control	Administrative Control	Personnel Control
Error Prevention	<b>X</b>	<b>X</b>	
Performance Enhancement			

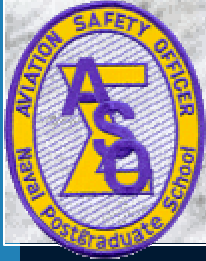


# Human Factors Intervention Strategy Matrix



*"We Need to Start Thinking Out of the Box"*

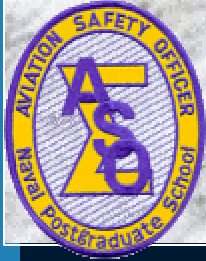




# Human Factors Quality Management Board

## Watershed Event





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## Watershed Event







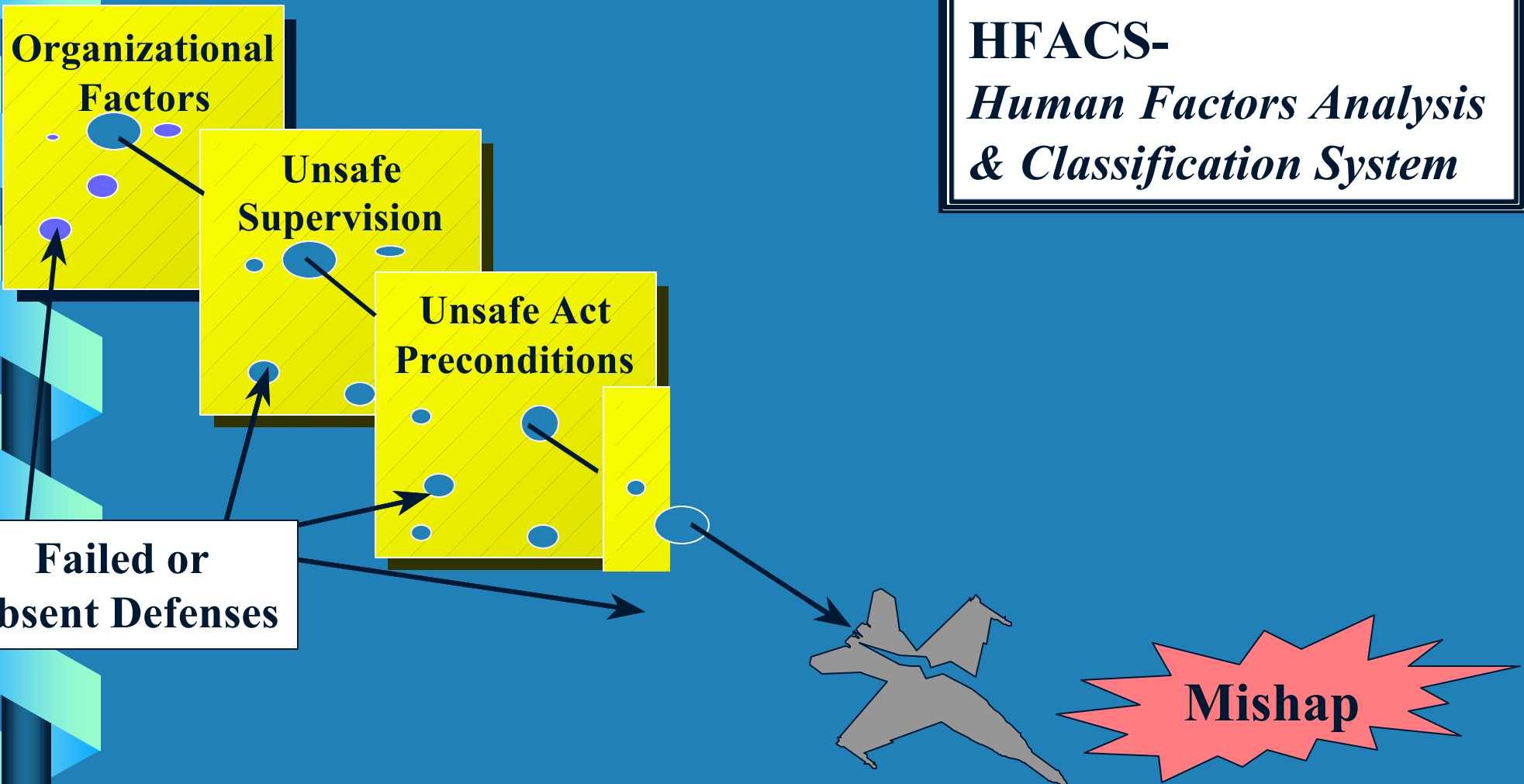
# Mishap Data Analysis in Naval Aviation

- **Naval Aviation Safety Program (OPNAV 3750)**
  - **Specifies Reporting Requirements (3 W's)**
  - **Covers Major Mishaps to Minor Hazards: Supervisory, Aircrew, Maintenance, Material, & Facility (Focus ENG & ADM, touches HF Issues)**
- **Naval Safety Center Safety Information Management System (SIMS)**
  - **Relational Database Structured IAW 3750.6Q**
  - **Permits Structured Reports & On-line Queries**



# Mishap Data Analysis: Reason's "Swiss Cheese" Model

**HFACS-**  
*Human Factors Analysis  
& Classification System*





# Mishap Data Analysis: Reason's "Swiss Cheese" Model

**HFACS-**  
*Human Factors Analysis  
& Classification System*

**Organizational  
Factors**

**Unsafe  
Supervision**

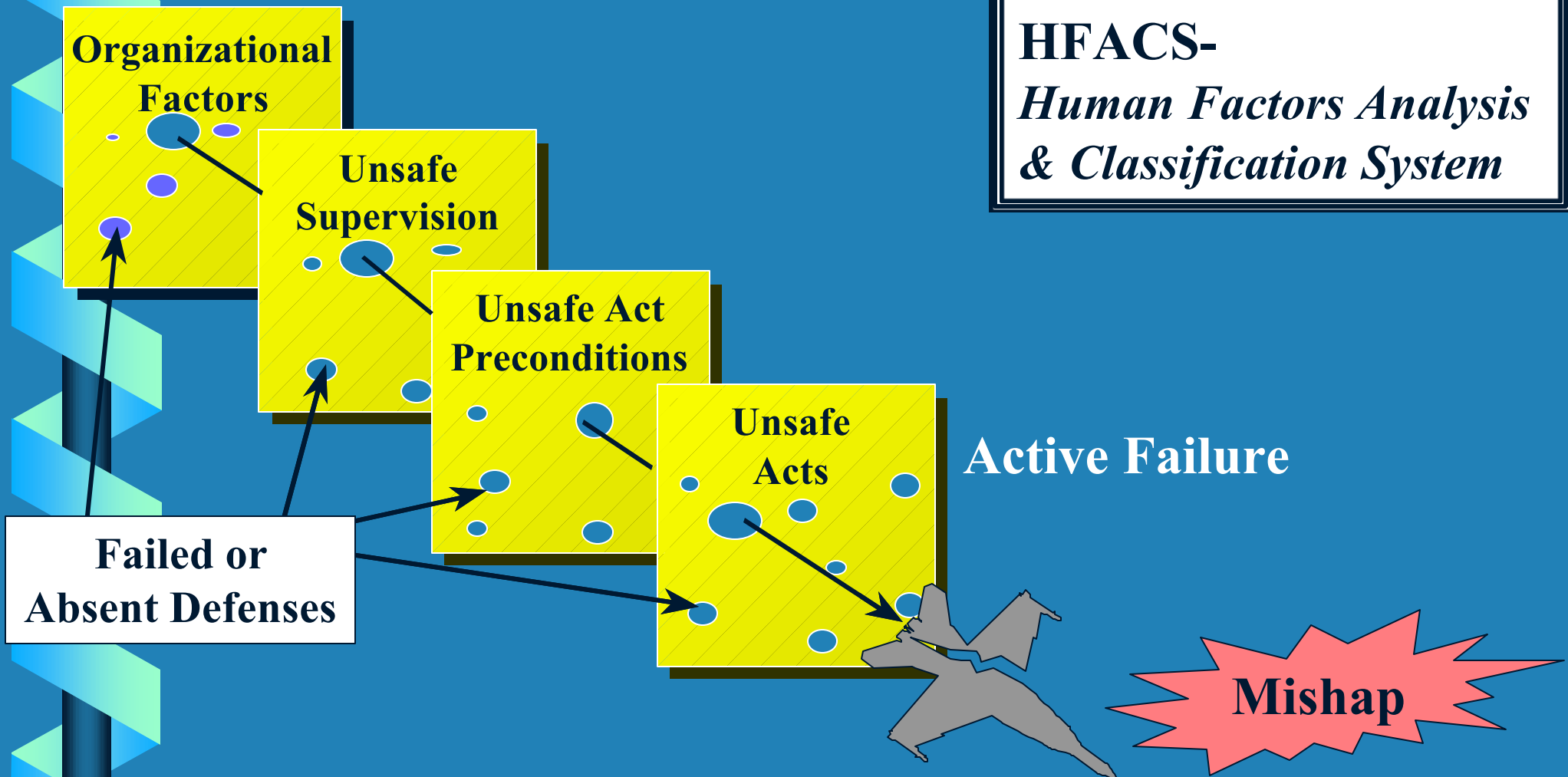
**Unsafe Act  
Preconditions**

**Unsafe  
Acts**

**Active Failure**

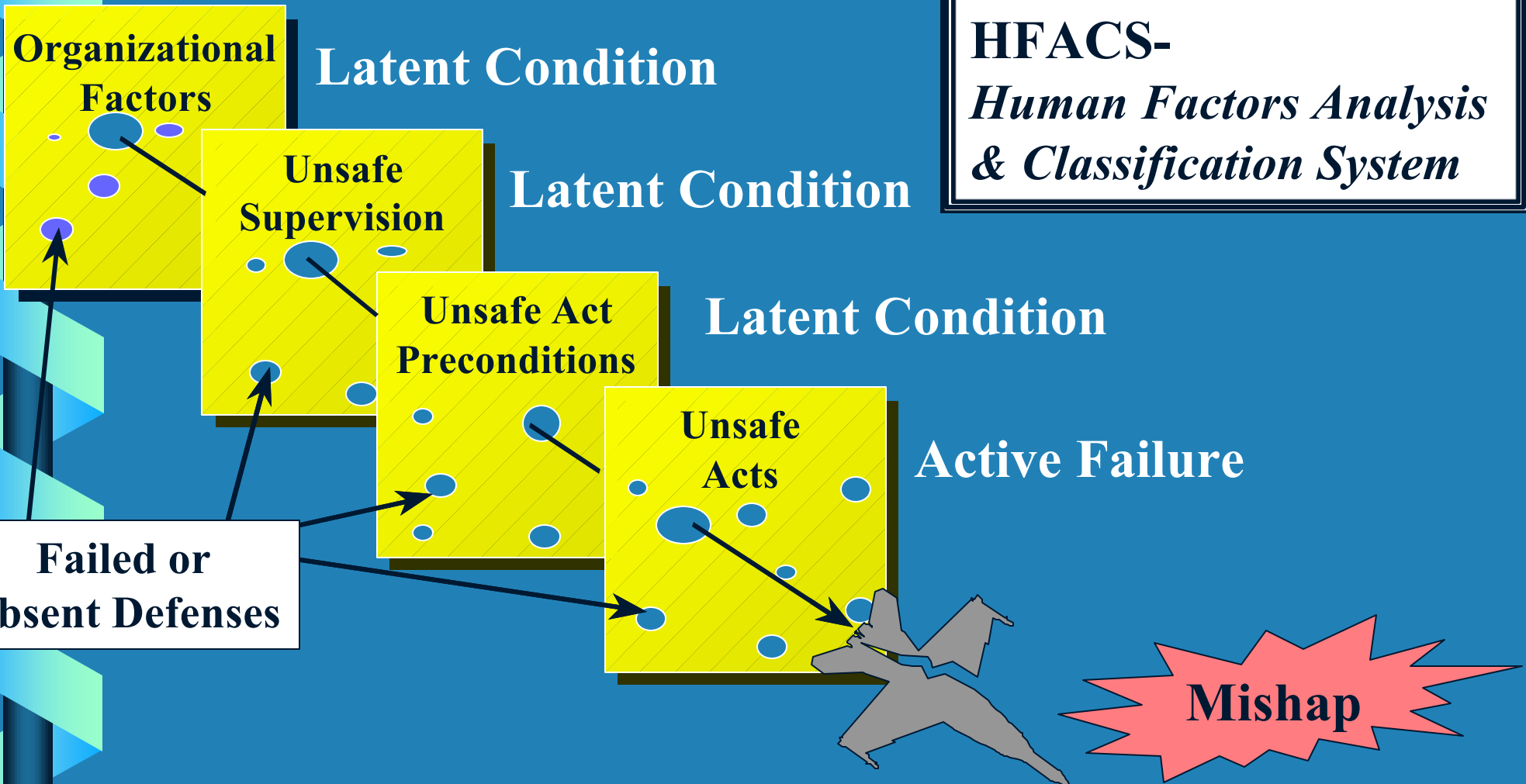
**Failed or  
Absent Defenses**

**Mishap**



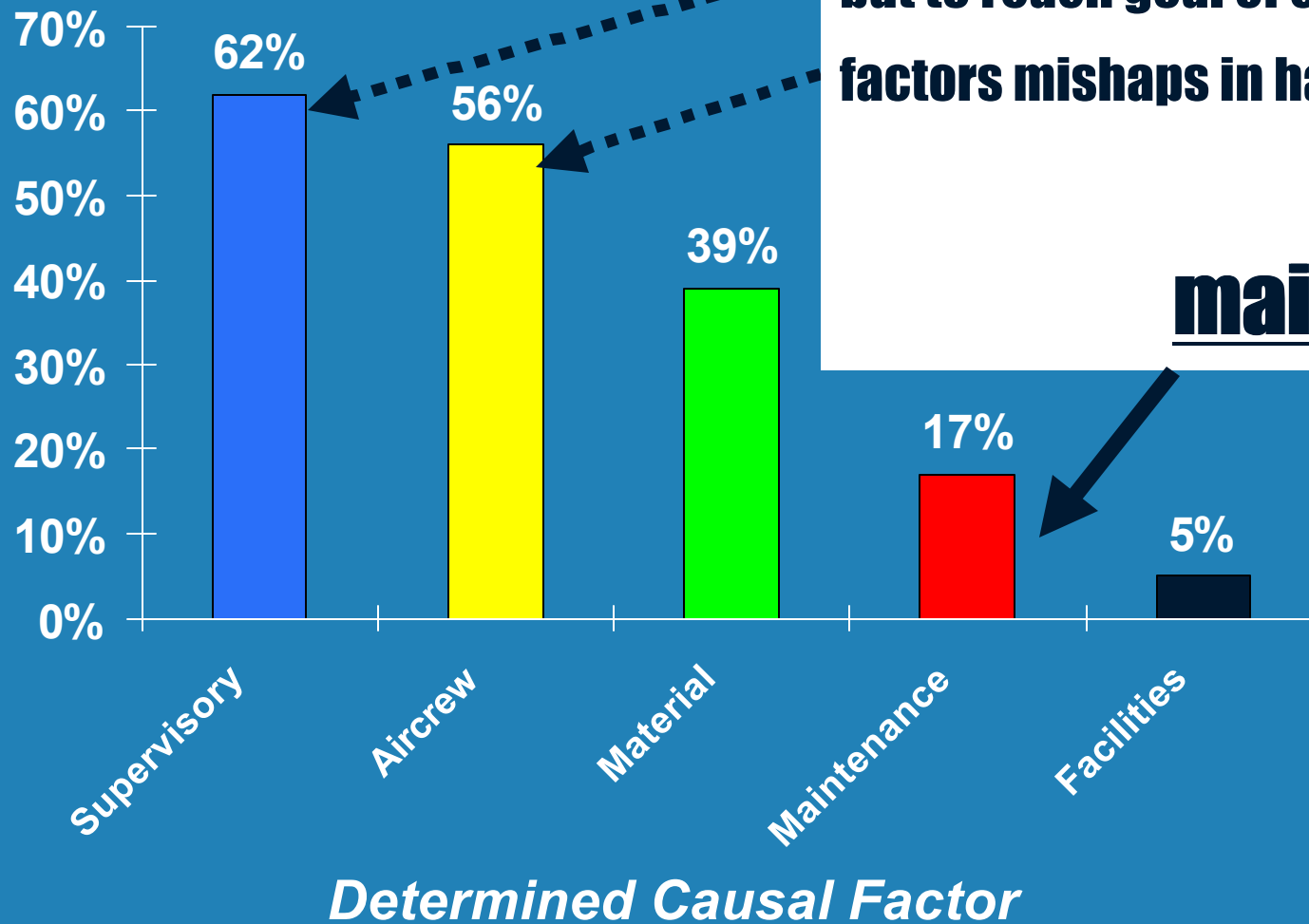


# Mishap Data Analysis: Reason's "Swiss Cheese" Model





# Mishap Data Analysis Focus: Naval Aviation Class A FM Causal Factors



**Initial emphasis on “Pilot Error”;  
but to reach goal of cutting human  
factors mishaps in half the focus**

**maintenance**





# HFACS-ME Model

## ORGANIZATIONAL CLIMATE

Supervisory  
Conditions

Maintainer  
Conditions

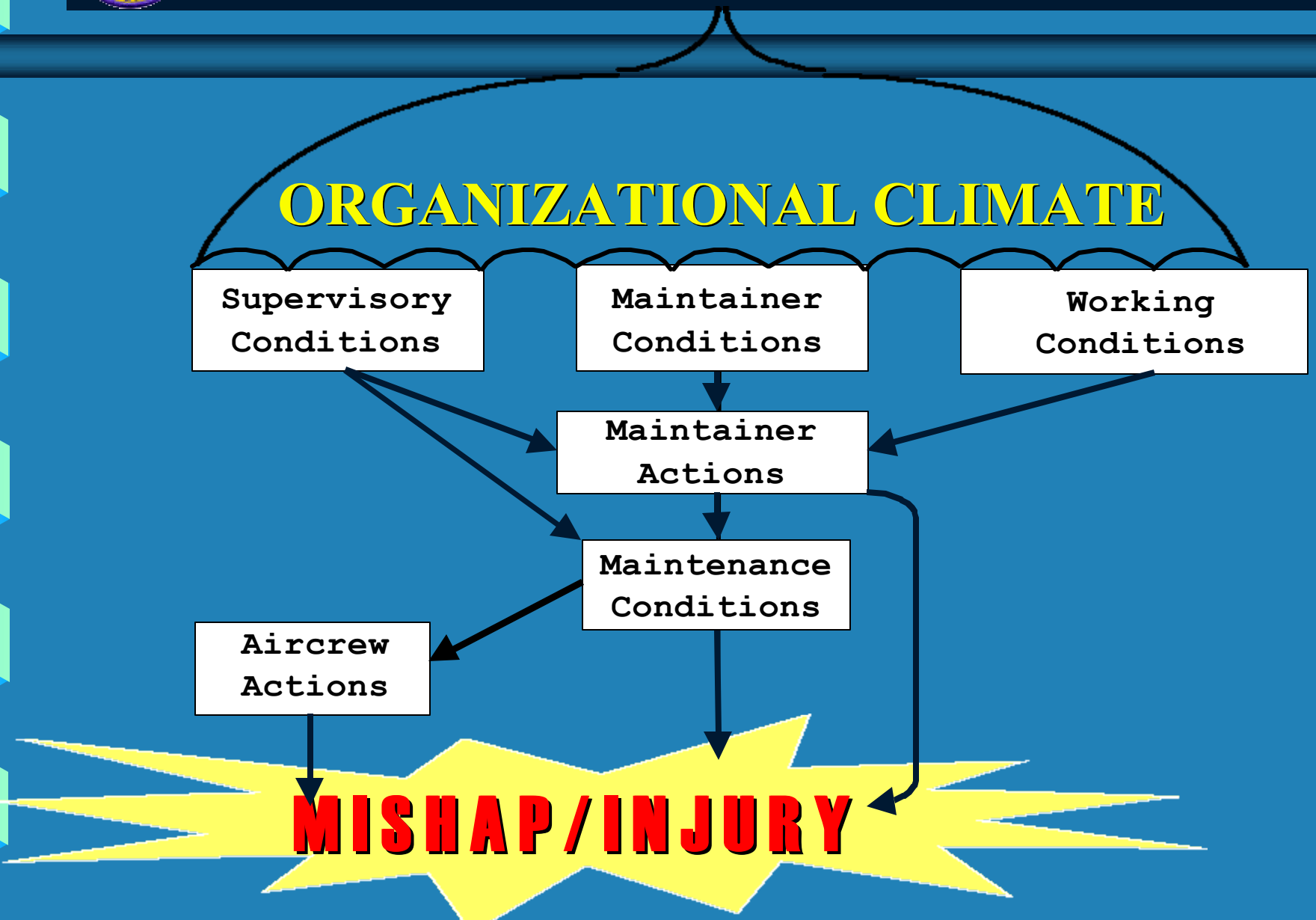
Working  
Conditions

Maintainer  
Actions

Maintenance  
Conditions

Aircrew  
Actions

**MISHAP/INJURY**





# HFACS- *Maintenance Extension*

**Supervisory Conditions**

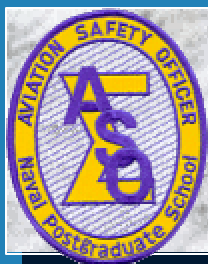
**Working Conditions**

**Maintainer Conditions**

**Maintainer Acts**

**3 ORDERS**







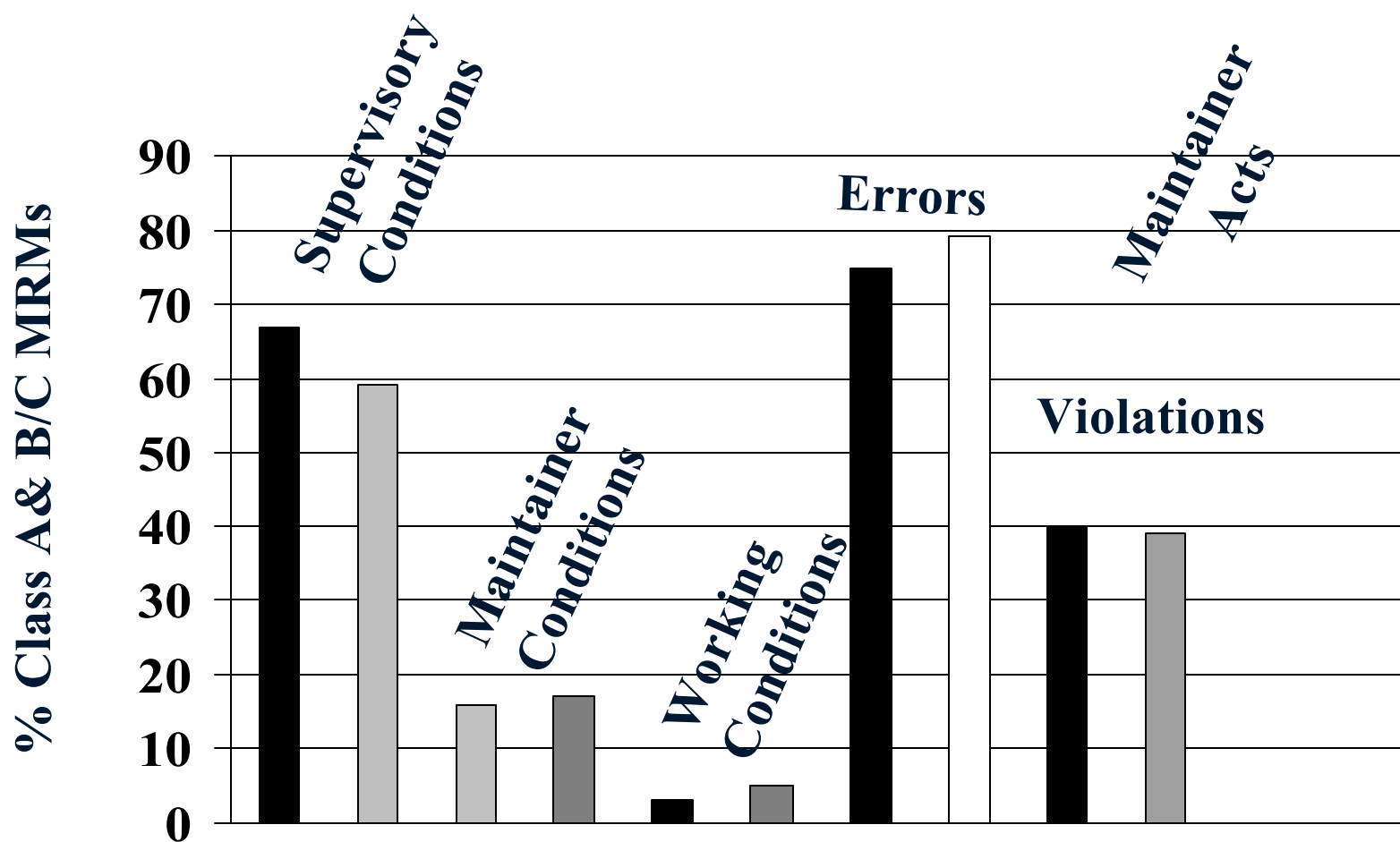
# Human Error in Maintenance Related Mishaps (FY 90-97)

- 470 Maintenance Related Mishaps Were Analyzed For Human Errors
- Classification Process Performed by Naval Maintenance Personnel





## HFACS-Maintenance Extension Profile: Class A vs. B/C MRMs







# General Findings

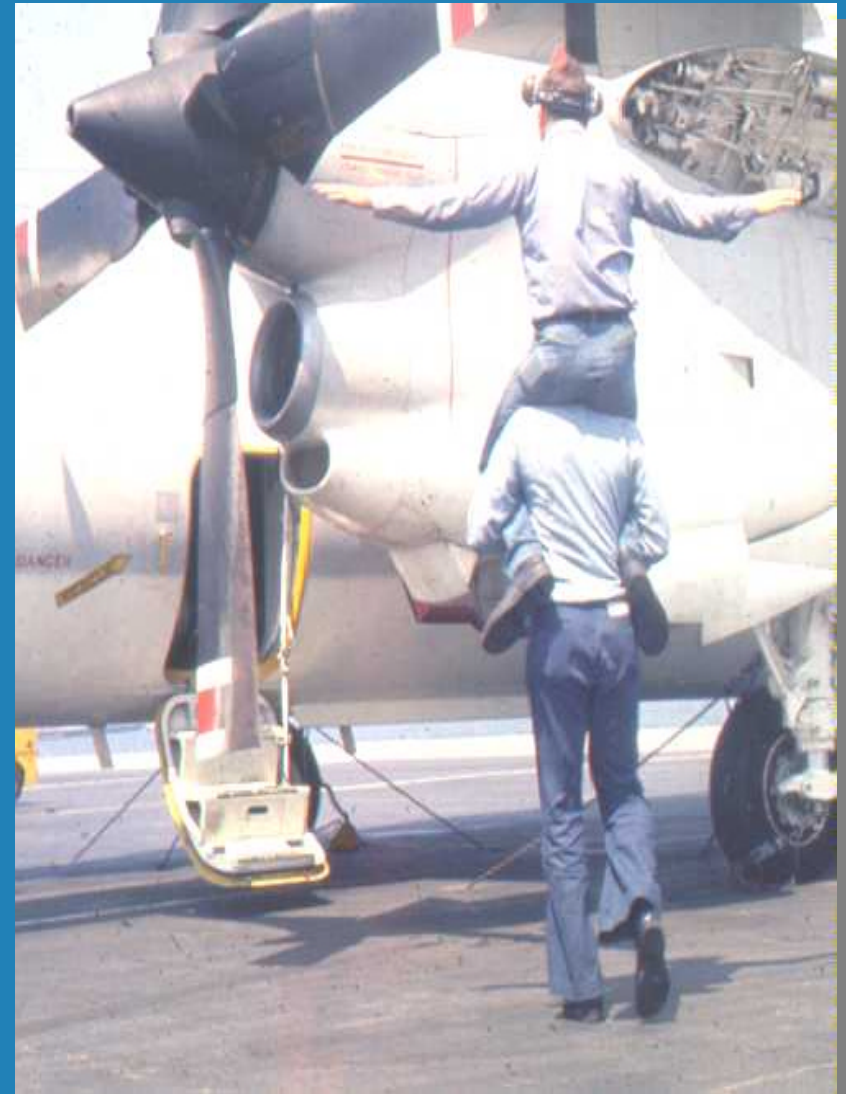
**Poor/Non - existent maintenance procedures**

**Inadequate/Poor Supervision of Maintenance Evolutions**

**Miscommunication - supervisor to subordinate, pass-down, or shift turnover**

**Not using, lack of, or outdated**

**Violations - not following policy, procedures, checklists, etc.**





# HFACS-ME Implementation

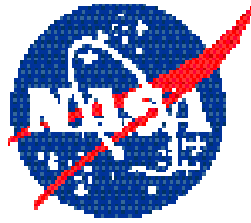
- **HFACS-ME Adopted for Inclusion in 3750.6R**
- **Results Influencing the Naval Aviation Maintenance Program Policies (4790.2G)**
- **Tailored Training Materials for Users**
- **Data Collection/Analysis Tool Development**
- **Interim Construction of HFACS-ME Database (training, intervention, & ROI)**



# Supporting Agencies/Sponsors



**Medical Specialties Division  
FAA Office of Aviation Medicine**

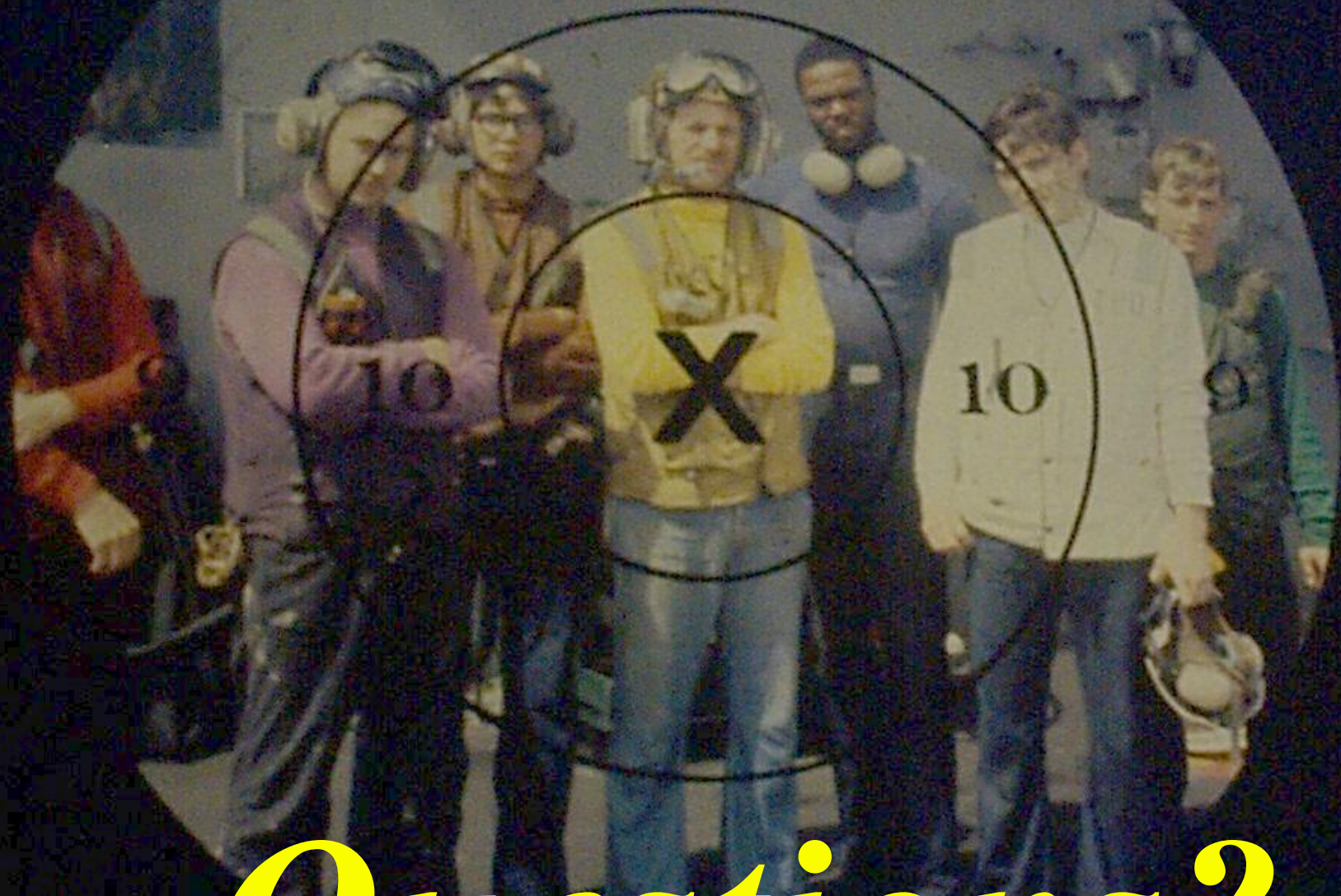


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*Questions?*